

**REMARKS/ARGUMENTS**

In the Office Action dated November 13, 2008, claims 1-4 and 30-34 were pending in the application, and claims 5-13 and 18-29 are withdrawn from consideration as being drawn to a non-elected invention.

Claims 1-4 and 30-34 stand rejected under 35 U.S.C. § 102(a) as anticipated by or, in the alternative, under 35 U.S.C. § 103(a) as obvious over *T. He and R. J. Cava, "Reactivity of MgB<sub>2</sub> with common substrate and electronic materials," Applied Physics Letters, Vol. 80, No. 2, 14 January 2002, pp. 291-293 (hereinafter "He et al.")*.

Claims 1-4 are cancelled; claim 30, 32 and 34 amended and claims 35-45 are newly added. Support for the amended and new claims can be found at least in paragraphs 0005-0008, 0015-0018, 0032-0035, 0040-0044, and Examples 1 and 2.

***Rejection under 35 C.F.R. 102(a), 103(a) (He et al.)***

Claims 1 to 4 stand rejected under 35 U.S.C. § 102(a) as anticipated by or, in the alternative, under 35 U.S.C. § 103(a) as obvious over He et al.

*He et al.* teach the reactivity of magnesium diboride with common substrates and electronic materials. The Applicants point out that He et al. describes experiments to determine the compatibility of magnesium diboride with potential substrate materials for applications in thin-film electronic devices, and has absolutely nothing to do with improvement of critical current density of magnesium diboride superconductors. The Applicants further point out that the purpose of the *He et al.* paper was to determine whether many common electric and substrate materials can react with magnesium diboride, because such reactions are undesirable for some applications of electronic devices. *He et al.* simply discloses that a "reaction" occurs between silicon carbide and magnesium diboride. *He et al.* describe experiments for determining whether various materials could be suitable for use as a substrate for MgB<sub>2</sub> film growth. As "MgB<sub>2</sub> with altered cell size" was formed when silicon carbide was heated in the presence of magnesium and boron, *He* simply concludes that silicon carbide would not be suitable as a substrate. *He et al.* in no way discloses that the "MgB<sub>2</sub> with altered cell size" could be used as a superconductor, let alone that a magnesium boride superconducting material including a silicon carbide dopant or a material having the formulas

referred to in the claims of the present application could provide enhanced superconducting properties.

In contrast, the subject matter of the present application relates to the surprising discovery that silicon carbide can be doped into magnesium boride to form a superconducting material having enhanced critical current density ( $J_c$ ), irreversibility field ( $H_{irr}$ ) and flux pinning properties compared to conventional magnesium diboride superconductors. Indeed, the Applicants submit that SiC doping can enhance  $J_c$  and  $H_{irr}$  substantially ( $J_c$  for 10 wt% SiC doped  $MgB_2$  wire increases by a factor of 32 (compared to non-doped  $MgB_2$  wire) at 5K and 8T, by a factor of 42 at 20K and 5T, and by a factor of 14 at 30K and 2T;  $H_{irr}$  increases by 40% at 20K). The experiments have shown that at 5K and 4.5T, the  $J_c$  of SiC doped  $MgB_2$  was  $133,000 \text{ A/cm}^2$ , which is comparable to that for NbTi superconductors. At 15 K and 4T,  $J_c$  was over  $100,000 \text{ A/cm}^2$ , which is comparable to that for Ag/Bi-2223 superconductors, and at 20 K and 4T,  $J_c$  was double that of the best thin film superconductors and an order of magnitude higher than that of the best Fe/ $MgB_2$  superconductor tapes.

Applicants respectfully submit that *He et al.* paper relates to a different field of endeavour to that of the present invention. Indeed, to the best of the Applicants' knowledge, no subsequent journal article has cited *He's* article in the context of describing silicon carbide doping to improve the properties of magnesium boride superconductors. Applicants submit that if including a silicon carbide dopant in a magnesium boride superconductor could be anticipated from *He et al.*, then the paper would have at least attracted some citations in this respect in the seven years since the article was published.

In this respect, the inventors have performed a number of searches and inform us that *He's* article has only been cited by 19 subsequent journal articles, none of which relate to silicon carbide doping to improve properties of magnesium boride superconductors. In contrast, the inventors' papers describing this invention, published after filing the present patent application, have attracted 781 citations. Furthermore, the inventors inform us that since that time, 96 articles relating to doping silicon carbide into magnesium boride superconductors have been published (attracting 1239 citations), none of which have referred to *He* (to the best of the inventors' knowledge). We submit that this clearly demonstrates that

*He* would not teach or motivate one of ordinary skill in the art to dope silicon carbide into magnesium boride superconductors in order to enhance superconducting properties.

Based on the above, Applicants respectfully submit that *He et al.* do not teach or suggest that the superconducting properties of a magnesium diboride semiconductor could be enhanced by doping it with silicon carbide.

Applicants amended claim 34 to clarify the subject matter of the invention and to emphasize that the doping of the magnesium boride by silicon carbide enhances the superconductor properties.

Applicants further cancelled claims 1-4, and added claims 35-38 corresponding to claim 1-4 but dependent on amended claim 34. Claims 30 and 32 are amended to depend upon claim 34. Applicants also introduced new claims 39-45 for a method of producing the claimed superconductor material. The support for this claims can be found in the Examples on pages 12-14 of the specification.

For the above reasons, the Applicants respectfully submit that the pending claims 30-45 as previously filed, recently amended and newly introduced are novel and not obvious over *He et al.* and, request reconsideration of the rejection.

Application No. 10/518,948  
Reply to Office Action of November 13, 2008

***Conclusion***

For all of the reasons listed above, the Applicants respectfully request reconsideration and allowance of pending claims 30-45. The Examiner is invited to contact the undersigned attorney to expedite prosecution.

The Commissioner is hereby authorized to charge any additional fees which may be required with respect to this communication, or credit any overpayment, to Deposit Account No. 06-1135.

Respectfully submitted,  
FITCH, EVEN, TABIN & FLANNERY

A handwritten signature in black ink, appearing to read 'James P. Krueger', is positioned above the printed name and registration number.

James P. Krueger  
Registration No. 35,234

**FEB 13 2009**

120 South LaSalle Street  
Suite 1600  
Chicago, Illinois 60603-3406  
Telephone (312) 577-7000  
Facsimile (312) 577-7007  
514237